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10/006,462	12/04/2001	Steven R. Walther	V0077/7165WRM	5689

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EXAMINER	
CROWELL, ANNA M	

ART UNIT	PAPER NUMBER
1763	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,462	WALTHER, STEVEN R.	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 December 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) *6-9,15-17 and 28-33* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5, 10-14, and 18-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-33* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2 and 3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-5, 10-14, and 18-27, drawn to an apparatus, classified in class 118, subclass 723e.

   II. Claims 6-9, 15-17, and 28-33, drawn to a method, classified in class 427, subclass 569.

2. Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the apparatus as claimed can be used to practice another and materially different process, such as etching.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Mr. Mark Superkl on October 28, 2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-5, 10-14, and 18-27. Affirmation of this election must be made by applicant in replying to this

Office action. Claims 6-9, 15-17, and 28-33 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear how a "pulse rate is much greater than a rotation speed". For purposes of examination, the pulse rate is faster than the rotational speed.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Foster et al. (U.S. 5,567,243).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced

apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to teach a mechanism for rotating the workpiece with rotational speed in a range of about 10-600 rpm.

Referring to Figure 2 and column 12, line 36-column 14, line 48, Foster et al. discloses a plasma processing apparatus comprising a mechanism for rotating the platen 46 such that the workpiece 48 rotates about its center at a rotational speed between 0-2000 rpm to ensure uniform processing and desired processing rate (col. 13, lines 49-65, col. 8, lines 23-25). Additionally, plasma is pumped down to the substrate by using a rotating platen (col.4, lines 30-31). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the platen of Liebert et al. with a rotating mechanism that rotates at speeds in a range between 0-2000 rpm in order to pump the plasma down to the substrate and achieve uniform processing at the desired processing rate.

With respect to claim 3, the pulse source of Liebert et al. has a pulse rate of 100 Hz to 2 kHz which is capable of operating at a faster rate than the rotational speed of Foster et al. at 0-2000 rpm.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Nakayama et al. (Japanese Patent Publication 01-022027).

Referring to Drawing 1 and the abstract, discloses a plasma doping apparatus comprising: a plasma doping chamber 1 containing a platen 4a for supporting a workpiece 6; a plasma source 10 for generating a plasma in the plasma doping chamber and for accelerating ions from the plasma into the workpiece; and a drive mechanism for rotating the workpiece.

11. Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Hirata (Japanese Patent Publication 57-023227).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to teach an anode having a spacing from the platen that varies over the area of the anode, wherein the anode comprises two or more anode elements and actuators for individually adjusting the spacing between the anode and the platen.

Referring to Drawings 3, 4, 5, and 10 and the abstract, Hirata teaches a plasma processing apparatus wherein the anode comprises two or more anode elements 9, 10, 11 and actuators 15, 16, 17 for individually adjusting the spacing between the anode elements 9, 10, 11 and the platen 3 in order to obtain an uniform processing rate. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the anode of Liebert et al. to have a spacing from the platen that varies over the area of the anode, and wherein the anode comprises two or more anode elements and actuators for individually adjusting the spacing between the anode and the platen as taught by Hirata in order to achieve an uniform processing rate.

Liebert et al. fails to teach that the two or more anode elements comprise annular rings.

Referring to Drawings 5 and 10, Hirata teaches a plasma processing apparatus wherein the two or more anode elements comprises an alternate shape of annular rings 74, 75,76. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the anode elements to be annular rings as taught by Hirata since this a known alternative configuration for plasma processing anodes. Additionally, the shape (annular rings) of the claimed anode elements is considered a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape of the claimed anode elements are significant.

12. Claims 18-20, 22-25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155).

Referring to Figure 1 and column 4, line 32-column 5, line 33, Liebert et al. discloses a plasma doping apparatus comprising: a plasma doping chamber 10; a platen 14 located in the plasma doping chamber for supporting a workpiece 20 (col. 4, lines 32-36); an anode 24 spaced apart from the platen in the plasma doping chamber (col.4, lines 44-46); a process gas source 36 coupled to the plasma doping chamber, wherein a plasma containing ion of the process gas is produced in a plasma discharge region between the anode and the platen (col.5, lines 4-8); a pulse source 30 for applying pulses between the platen and the anode for accelerating ions from the plasma into the workpiece (col.4, lines 50-57, col.5, lines 22-33).

Liebert et al. fails to specifically teach that the chamber having a cylindrical geometry.

Referring to column 2, lines 25-26, Setoyama et al. teaches a plasma processing apparatus having a chamber with a cylindrical geometry. It is conventionally known in the art for a chamber to have a cylindrical geometry. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to for the chamber of Liebert et al. to have a cylindrical geometry since this feature is conventionally known in the art.

Liebert et al. fails to teach a plurality of magnetic elements disposed around the plasma discharge region

Referring to Figure 1 and column 4, line 52-column 6, line 49, Setoyama et al. teaches a plasma processing apparatus having a plurality of magnetic elements 20a and 20b disposed around the plasma discharge region for efficiently confining the plasma for processing and easily maintaining the plasma density (col.6, lines 1-4). Additionally, the magnetic elements are

disposed on or near the anode 9. Furthermore, the magnetic elements are arranged in one or more annular rings (col. 5, lines 1-2). Moreover, the magnetic elements 20a and 20b have alternating polarities facing the plasma discharge region (col. 5, lines 1-6). Also, the magnetic elements 20b are arranged in a cylindrical array around the plasma discharge region (col. 5, lines 4-6). In addition, the magnetic elements produce cusp magnetic fields 30 in a region adjacent to the plasma discharge region (see Fig. 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. with the magnetic elements disposed around the plasma discharge region as taught by Setoyama et al. in order to efficiently confine the plasma for processing and to easily maintain the plasma density

13. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Shan et al. (U.S. 6,022,446).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach magnetic elements which are radially aligned to form a spoke configuration.

Referring to Figure 4a and column 8, lines 23-49, Shan et al. teaches a plasma processing apparatus wherein the magnetic elements 90 are radially aligned to form a spoke configuration. With this spoke configuration, a radially symmetrical magnetic field is generated to enhance processing rates. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to arrange the magnetic elements of Liebert et al. in view of Setoyama et al. in a

spoke configuration as taught by Shan et al. since a radially symmetrical magnetic field is generated to enhance processing rates.

14. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Goeckner et al. (U.S. 6,182,604).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach a hollow electrode surrounding the plasma discharge region.

Referring to Figure 2a-b and column 5, line 26-column 6, line 6, Goeckner et al. teaches a plasma doping apparatus which uses a hollow electrode 300 surrounding the plasma discharge region in order to produce a more uniform plasma at a lower gas pressure. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. in view of Setoyama et al. with a hollow electrode surrounding the plasma discharge region as taught by Goeckner et al. in order to produce a more uniform plasma at a lower gas pressure. Additionally, the apparatus of Liebert et al. in view of Setoyama et al. and Goeckner et al. is capable of positioning magnetic elements near the hollow electrode.

15. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liebert et al. (U.S. 6,020,592) in view of Setoyama et al. (U.S. 6,196,155) as applied to claims 18-20, 22-25 and 27 above, and further in view of Little et al. (U.S. 4,443,488).

The teachings of Liebert et al. in view of Setoyama et al. have been discussed above.

Liebert et al. in view of Setoyama et al. fail to teach a hollow electrode surrounding the plasma discharge region.

Referring to Figure 1 and column 2, line 55-column 4, line 46, Little et al. teaches a plasma processing apparatus which uses a hollow electrode 22 surrounding the plasma discharge region 12, wherein magnetic elements 30 are disposed near the hollow electrode in order to produce a large volume, low pressure, high temperature plasma yielding very high energy, charged ions. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Liebert et al. in view of Setoyama et al. with a hollow electrode surrounding the plasma discharge region as taught by Goeckner et al. in order to produce a large volume, low pressure, high temperature plasma yielding very high energy, charged ions.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yang '282 teaches a plasma doping apparatus having a rotatable platen. Niso et al.'399 and Hasegawa et al. '330 teach anode elements using actuators. DeOrnellas et al. '435 teaches magnetic elements with a spoke configuration.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (703) 305-1956. The examiner can normally be reached on M-F (8:00 - 4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

AMC amc

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